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**Lange et al.**

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(54) **PROCESS AND APPARATUS FOR PRODUCING WIPES WITH A PLEAT-LIKE ZONE ALONG THE LEADING EDGE PORTION**

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(22) Filed: **Aug. 26, 2004**

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**B31F 1/07** (2006.01)

(74) *Attorney, Agent, or Firm*—R. Joseph Foster, III; Scott A. Baum

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(57) **ABSTRACT**

(58) **Field of Classification Search** ..... 493/3, 493/69, 359, 433, 328; 221/48  
See application file for complete search history.

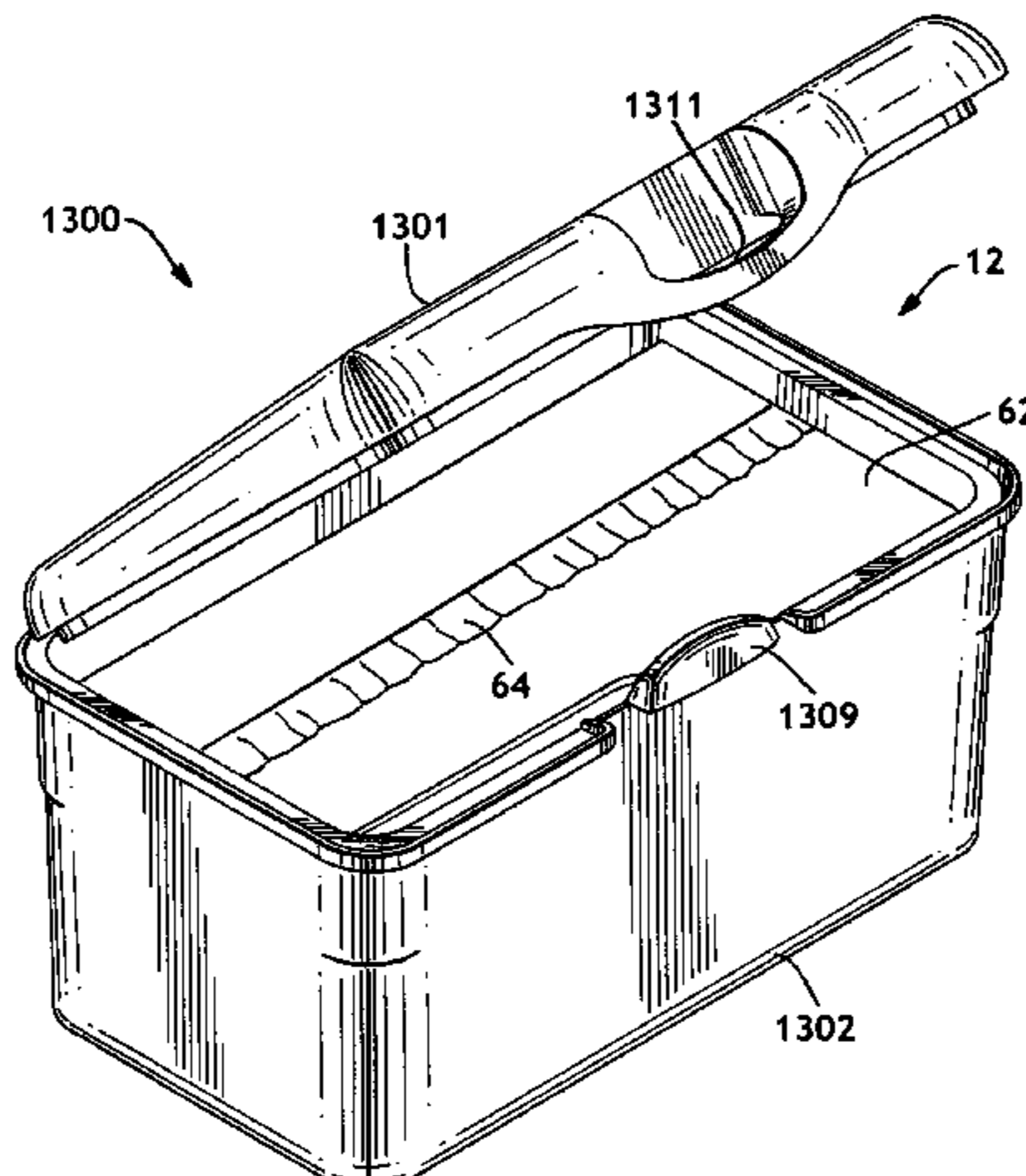
The invention relates to a stack of wipes for use in a wipes dispenser. The stack includes a plurality of wipes, each wipe of the plurality of wipes formed from a portion of a common material. Each wipe includes a leading edge portion with a pleat-like zone located along at least a portion of a length of the leading edge portion and the pleat-like zone is distinct from an adjoining main portion of each wipe. Each wipe is folded upon itself at least once and each wipe is positioned relative to adjacent wipes to form the stack of wipes.

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**7 Claims, 5 Drawing Sheets**



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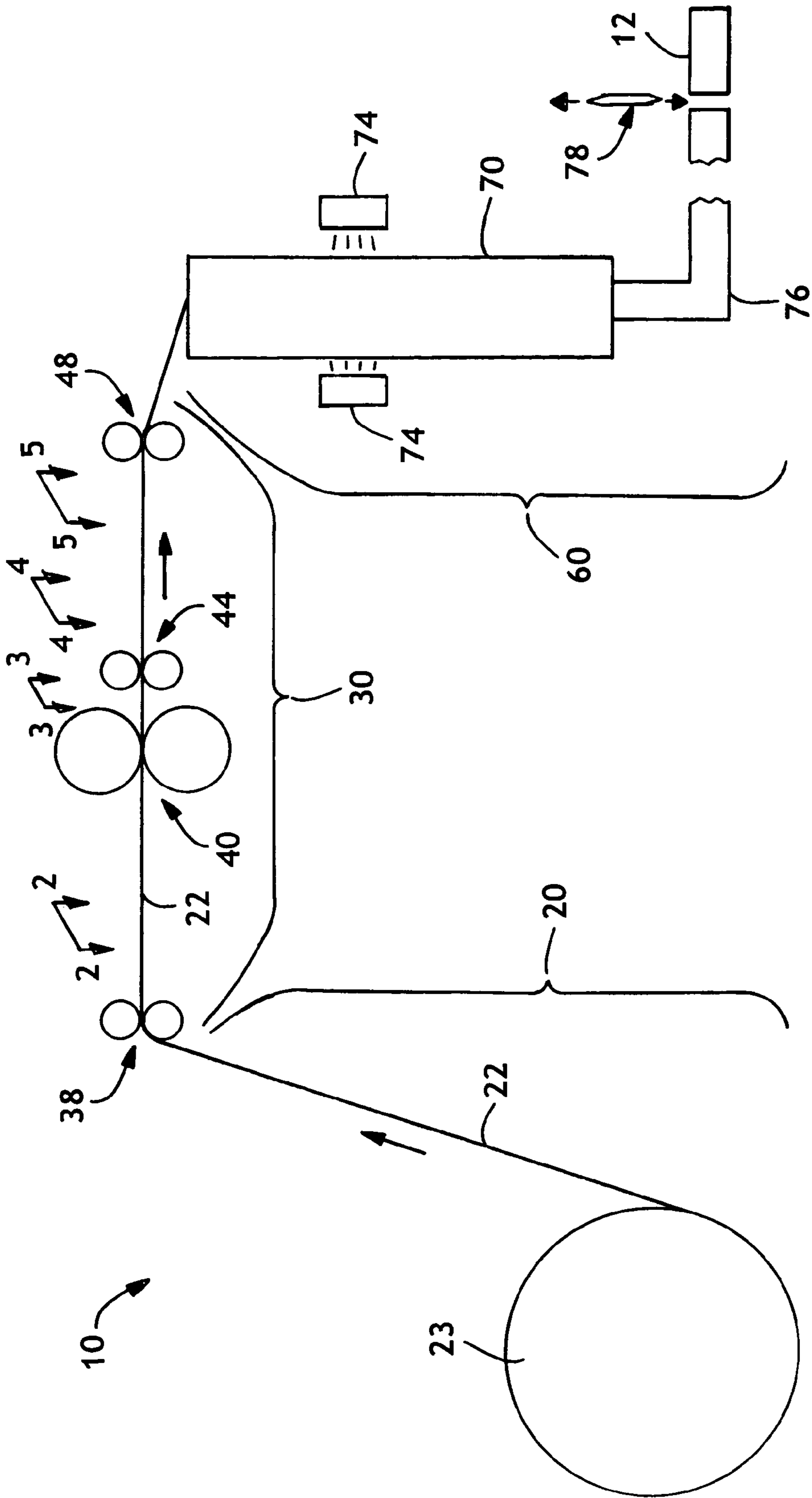


FIG. 1

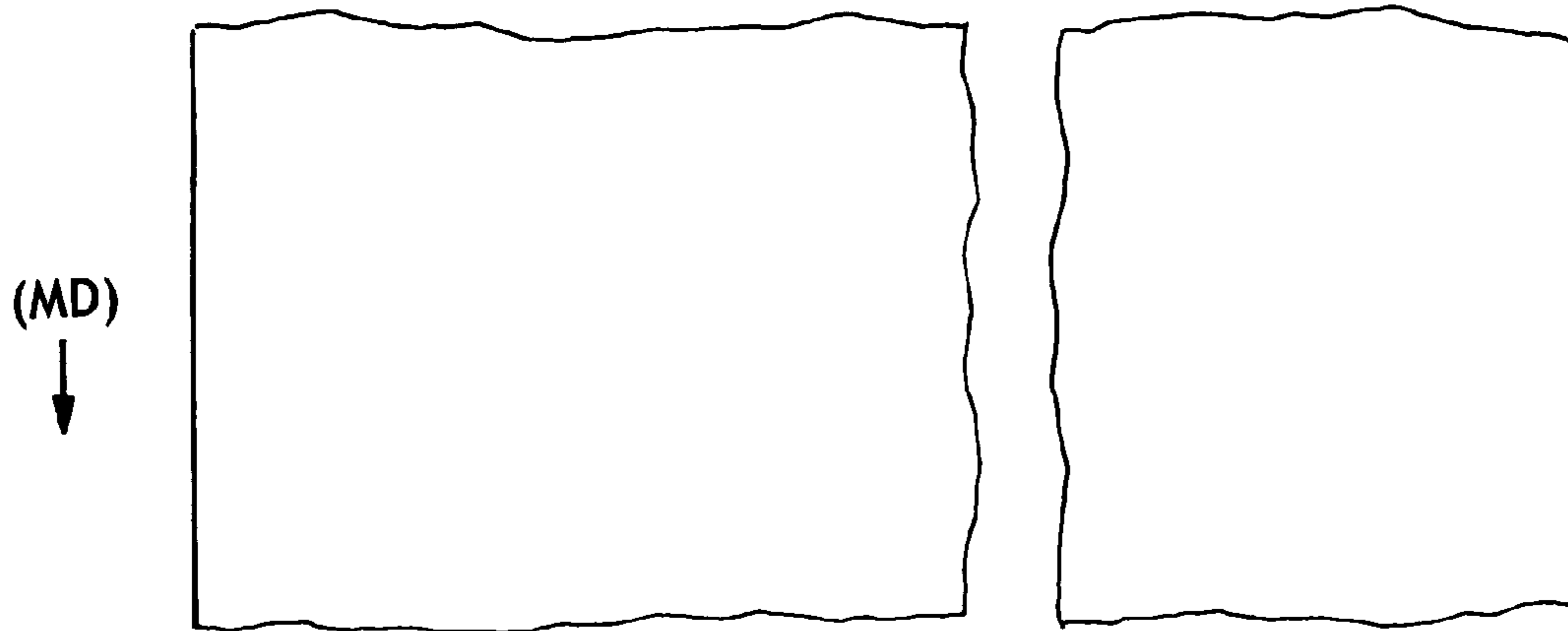


FIG. 2

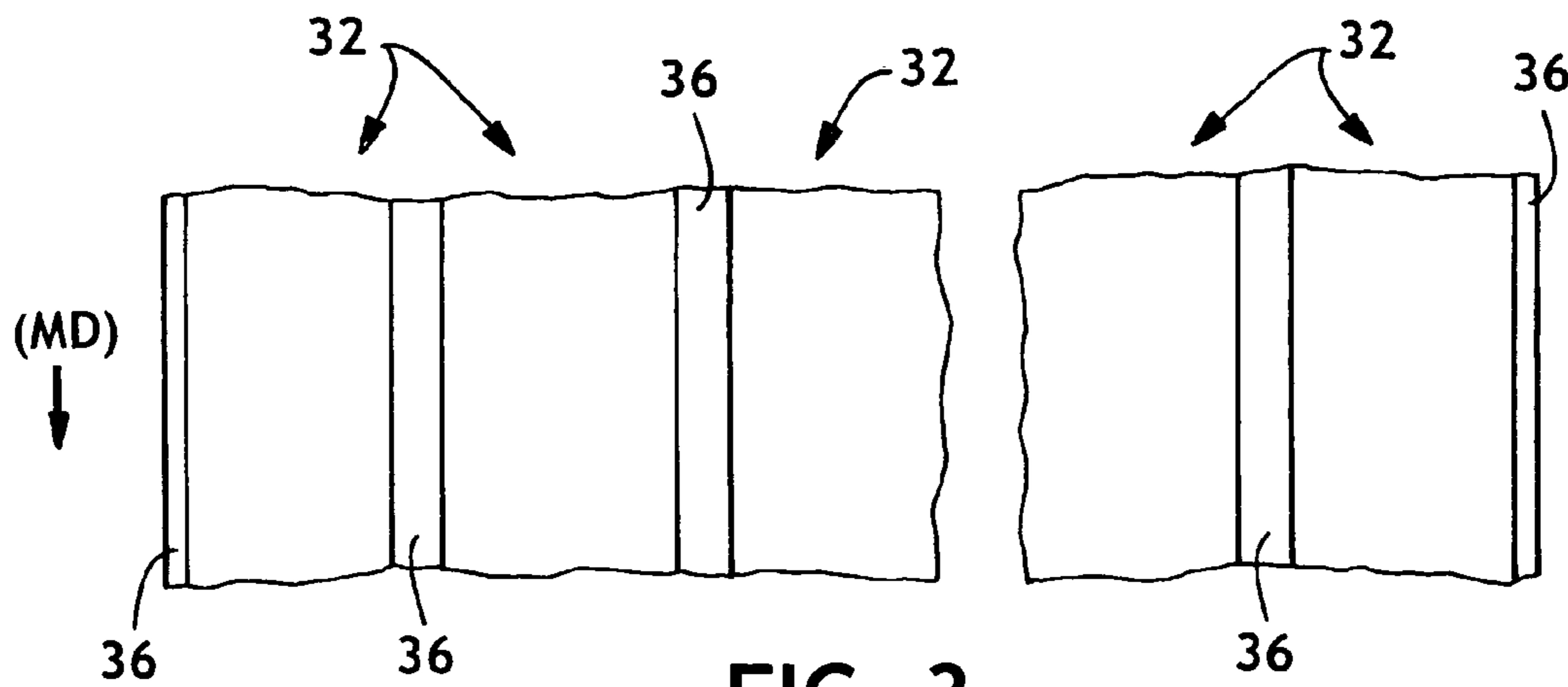


FIG. 3

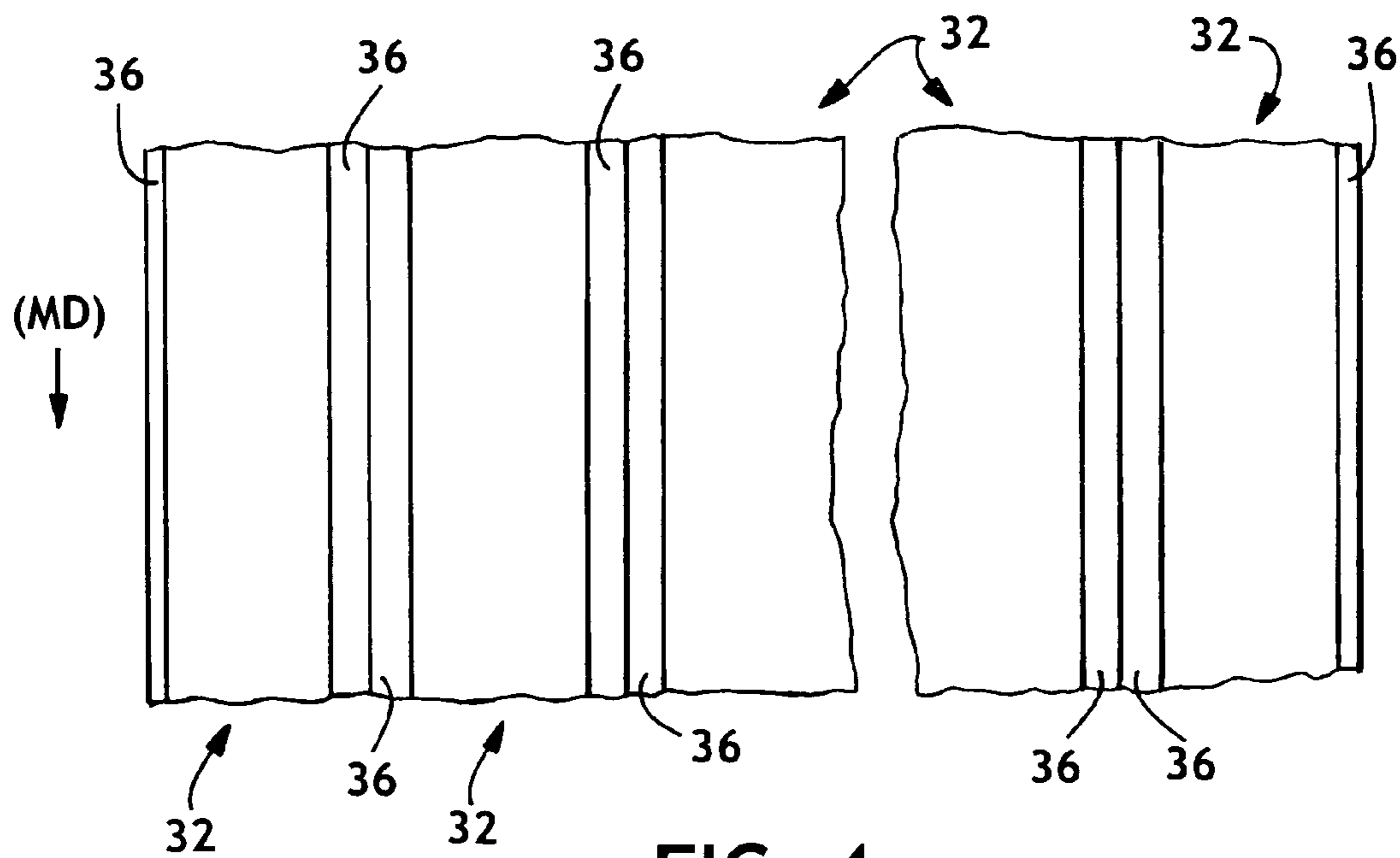


FIG. 4

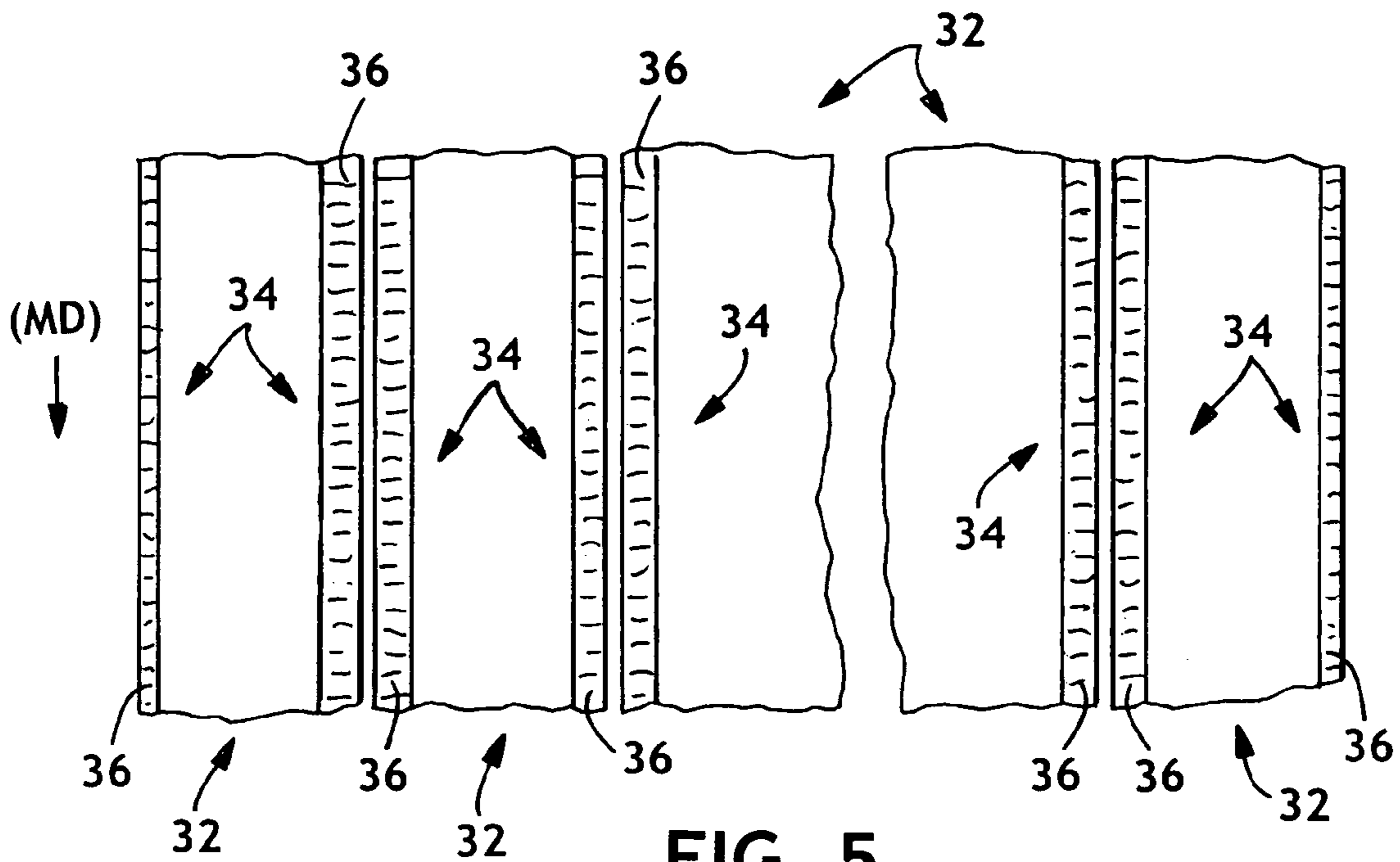


FIG. 5



FIG. 2A

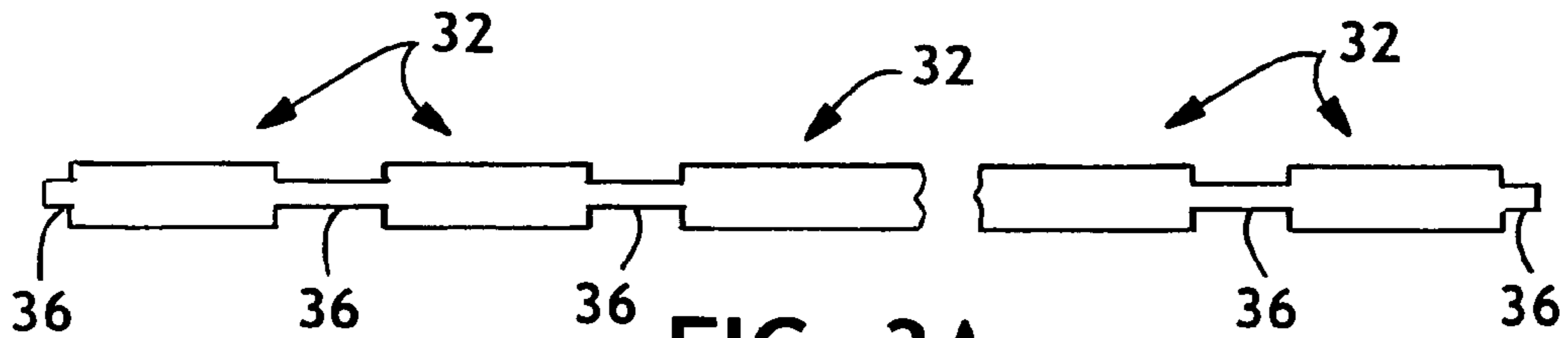


FIG. 3A

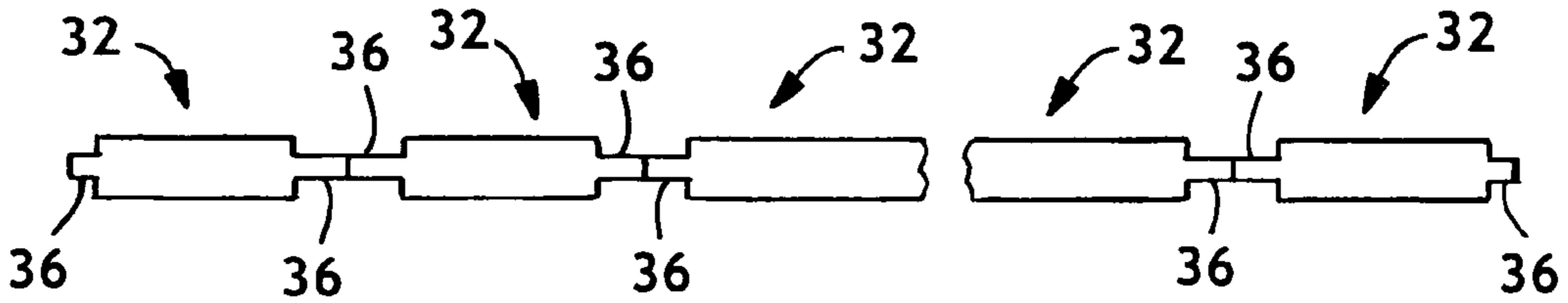


FIG. 4A

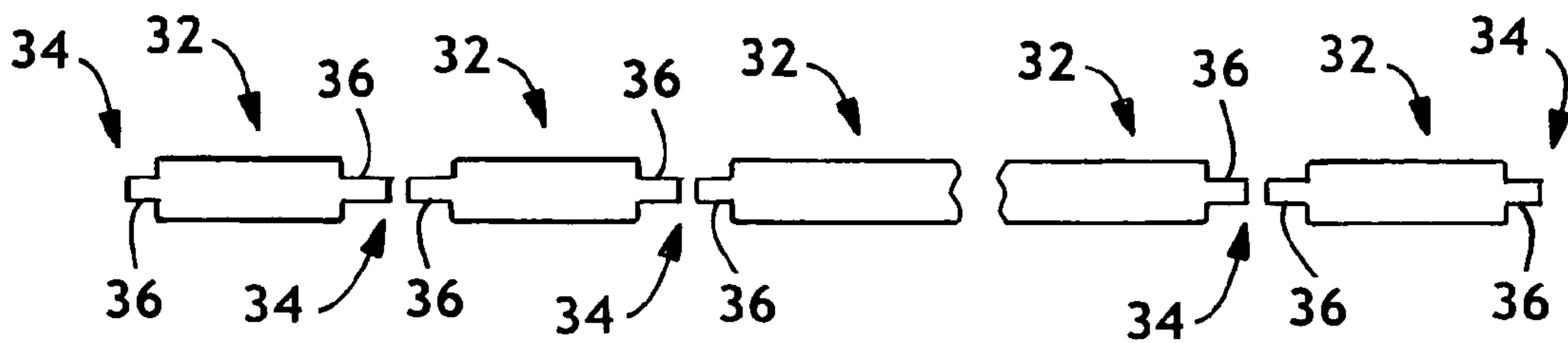


FIG. 5A

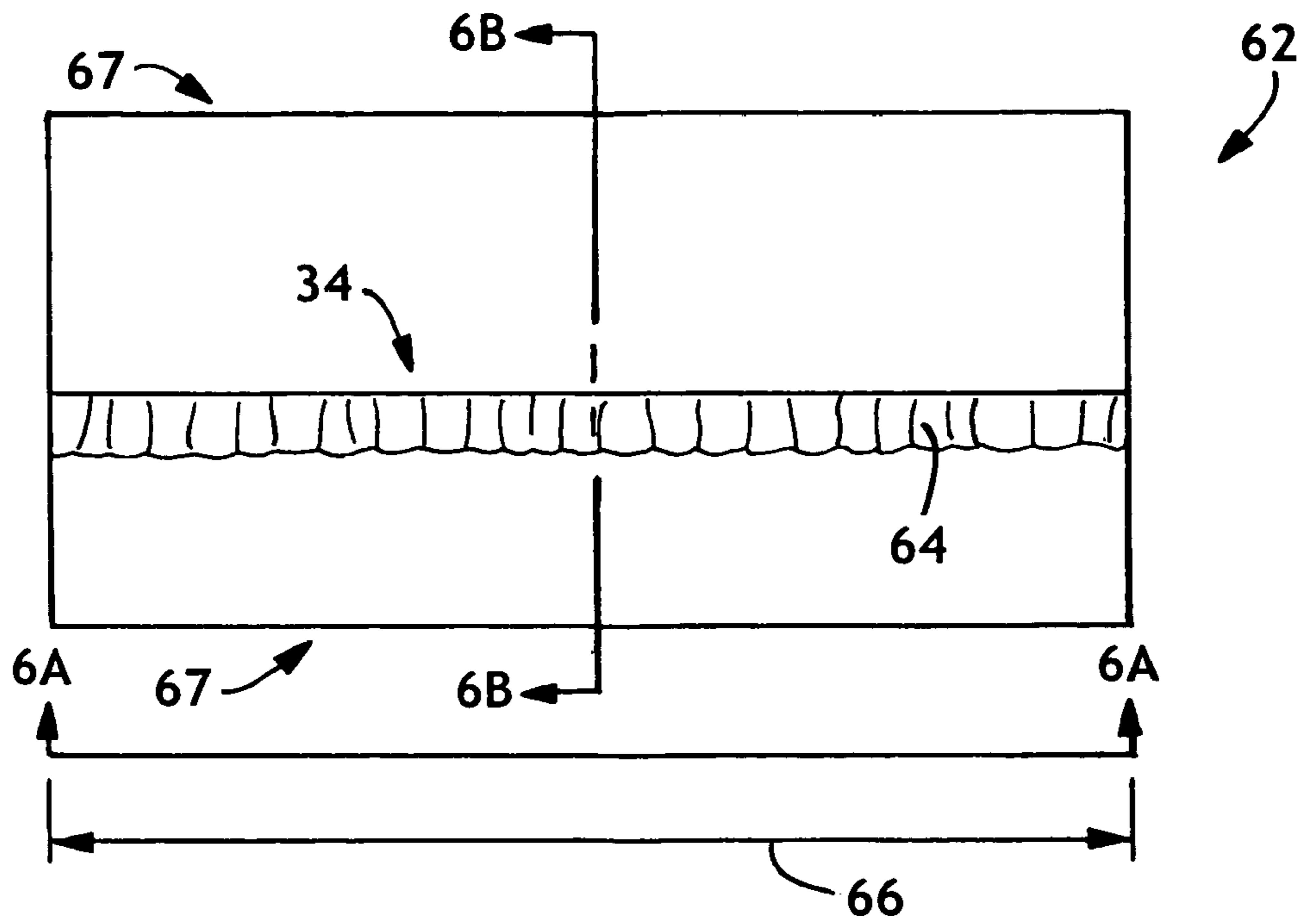


FIG. 6

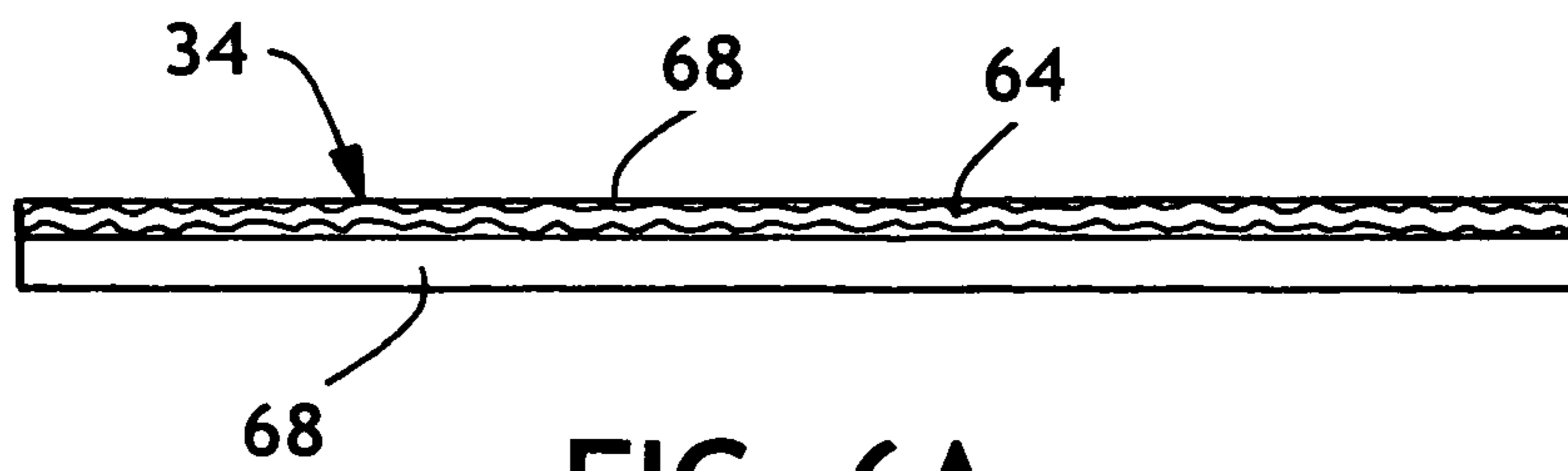


FIG. 6A

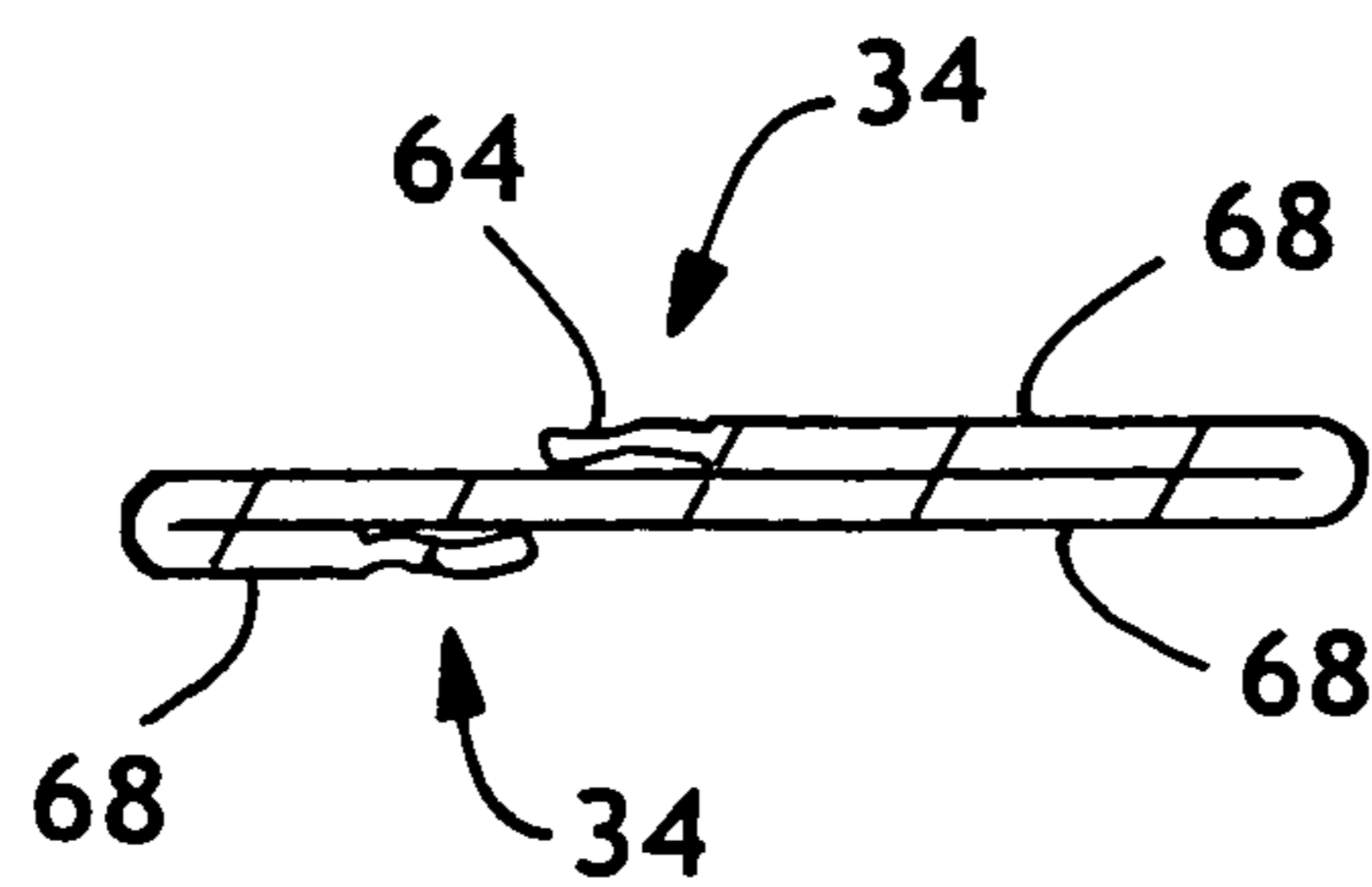


FIG. 6B

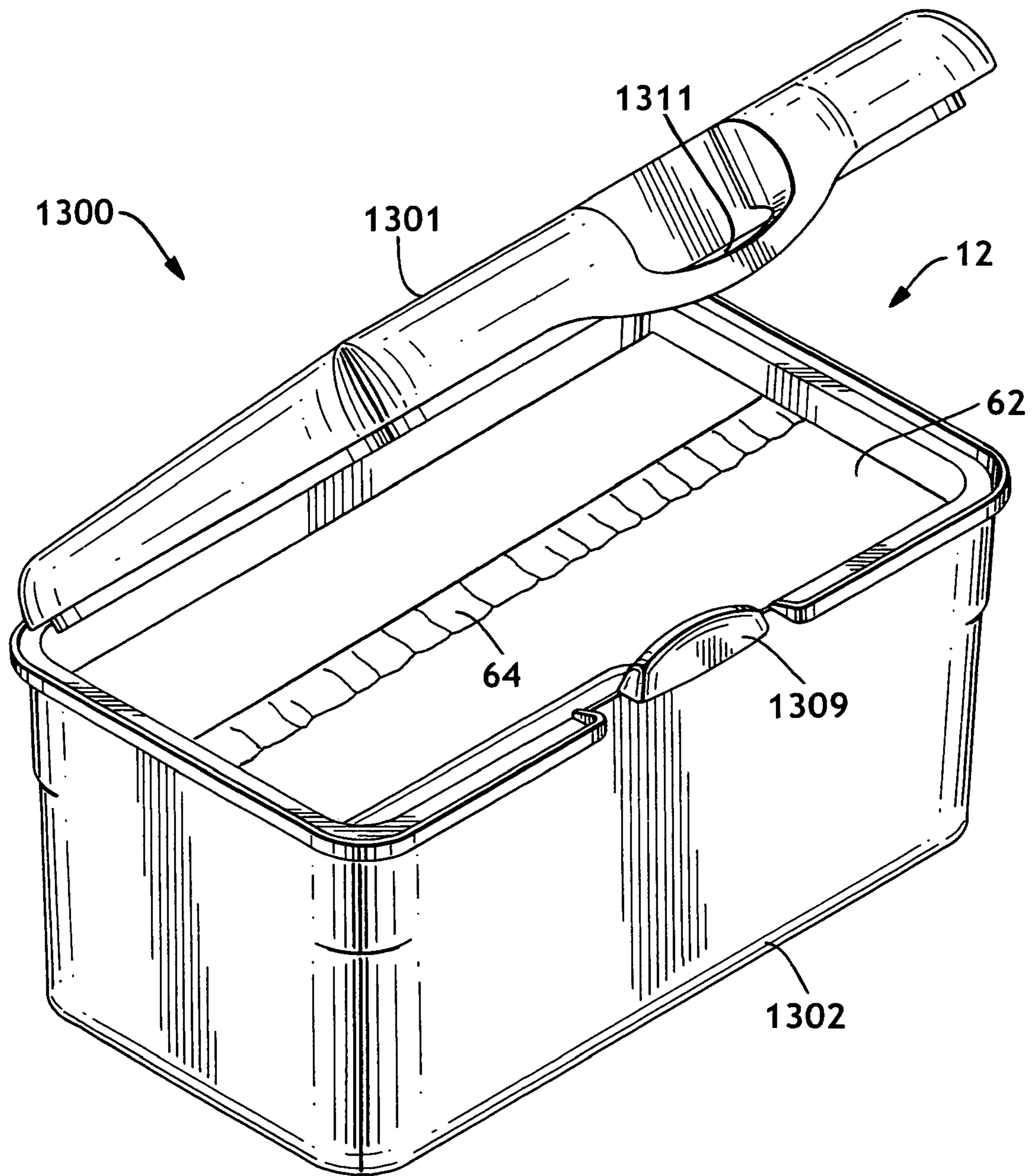


FIG. 7

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**PROCESS AND APPARATUS FOR  
PRODUCING WIPES WITH A PLEAT-LIKE  
ZONE ALONG THE LEADING EDGE  
PORTION**

This application is a divisional of application Ser. No. 10/318,827 entitled WIPES WITH A PLEAT-LIKE ZONE ALONG THE LEADING EDGE PORTION and filed in the U.S. Patent and Trademark Office on Dec. 13, 2002 now U.S. Pat. No. 6,848,595. The entirety of application Ser. No. 10/318,827 is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

Wipes have been made from a variety of materials which may be dry or wet when used. Perhaps the most common form of wipes has been a stack of moistened sheets which have been packaged in a plastic container and are known as wet wipes. Typically, the wipes have had linear (e.g., straight) or non-linear (e.g., curved or zigzagged) edges and a generally rectangular configuration. The wipes have also been available in either folded or unfolded configurations. For example, stacks of wipes have been available wherein each of the wipes in the stack have been arranged in a folded configuration such as a c-folded, z-folded, quarter-folded or other zigzag folded configurations, as are well known to those skilled in the art. Each folded wipe could have been interfolded with the wipes immediately above and below in the stack of wipes. Alternatively, wipes have been formed as discrete wipes that are separate from one another upon formation into a stack of wipes and that are intended to not interact with one another upon dispensing. Still alternatively, wipes have been in the form of continuous webs of material which include perforations to separate the individual wipes and which are wound into rolls or formed into zigzag shaped stacks and then packaged in plastic containers. Such wipes have been used for baby wipes, hand wipes, household cleaning wipes, industrial wipes and the like. The wet wipes have been made from a variety of materials and are moistened with a suitable wiping solution.

The conventional packages which contain stacks of wipes, such as those described above, have been designed to provide one at a time dispensing which may be accomplished using a single hand. Such single handed, one at a time dispensing is particularly desirable because the other hand of the user is typically required to be simultaneously used for other functions. For example, when changing a diaper product on an infant, the user typically uses one hand to hold and maintain the infant in a desired position while the other hand is searching for a wet wipe, such as a baby wipe, to clean the infant.

However, the dispensing of wipes in such stacks has not been completely satisfactory. For example, users of the wipes have had difficulties recognizing and grasping the leading edge of each individual wipe to dispense or remove the wet wipe from the package. This problem has been particularly acute when the individual wipes in the stack are folded such that the leading edge of each wipe is folded over upon another portion of the same wipe, e.g., in a c-folded, z-folded or other zigzag folded configurations. Typically, the user will frictionally drag from one to three fingers across the top surface of the stack of wet wipes in an attempt to locate the leading end edge of the top wipe from the stack of wipes. However, the leading edge of each wipe in such a folded configuration has tended to have an affinity for the other portions of the wipe, especially when the wipes have been arranged in a stacked configuration for a period of time, and/or when the wipes are wet wipes due to adhesion caused by the moistening solution. As a result, in

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use, it has been undesirably difficult for the user to locate the leading edge of each wipe from the other portions of the wipe to facilitate the dispensing of each wipe from the stack of wet wipes.

Moreover, as each wipe in the stack of wipes has been dispensed or removed from the stack, the trailing edge portion of the wipe has not always been easy to locate in case such is needed to separate the adjacent middle portion of the wipe from the trailing end. Such difficult location has undesirably caused the user to expend extra efforts searching for the edge to unfold the wipe to gain full access to its surface area for wiping. Such difficult location has undesirably resulted in reduced consumer acceptance.

The difficulties encountered in dispensing the existing wipes have been particularly evident in stacks of wipes which have a solution add-on (i.e., wet wipes, and particularly wipes with greater solution add-on) and in stacks of wipes which have a greater number of wipes. For example, each wet wipe and, in particular, the leading and trailing edges of each wet wipe, has had an increased affinity for the other portions of the same wet wipe as the amount of solution in the stack increases. As a result, the consistency and reliability of the dispensing of such wet wipes has undesirably declined as the amount of solution has increased. Accordingly, it is desired to provide a wipe and stack of wipes, each in a reach-in format, which have enhanced dispensability, particularly for wet wipes.

SUMMARY OF THE INVENTION

In response to the difficulties and problems discussed above, for example, a new feature for wipes in a stack of discrete wipes, and which may be cost effective and more reliable (e.g., reducing the likelihood of difficult wipe edge location during dispensing), has been developed. For example, dispensing may be enhanced or made easier when a top wipe is ready for dispensing upon the opening of a resealable wipes dispenser, by one or more of a visual and/or tactile cue. That is, a leading edge of the top wipe may be more consistently readily locatable relative to the stack of wipes so a user may readily find and grasp the edge and remove the entire individual wipe. As another example, dispensing may be enhanced or made easier when a folded wipe trailing edge is readily locatable so the entire wipe may be easily extended to full length by the user if desired. The purposes and features of the present invention will be set forth in and are apparent from the description that follows, as well as will be learned by practice of the invention. Additional features of the invention will be realized and attained by the product, process and system particularly pointed out in the written description and claims hereof, as well as from the appended drawings.

In one aspect, the invention provides a stack of wipes for use in a wipes dispenser. The stack includes a plurality of wipes, each wipe of the plurality of wipes formed from a portion of a common material. Each wipe includes a leading edge portion with a pleat-like zone located along at least a portion of a length of the leading edge portion and the pleat-like zone is distinct from an adjoining main portion of each wipe. Each wipe is folded upon itself at least once and each wipe is positioned relative to adjacent wipes to form the stack of wipes.

In another aspect, the invention provides a process for forming a stack of wipes. The process includes, in no particular order, though it may be advantageous, as follows: providing a supply of a common material; forming a plurality of panels, each panel adjacent to at least one other panel; creating a pleat-like zone located along at least one side of each



panel; converting the plurality of panels into a plurality of wiper, each wiper of the plurality of wipers including a leading edge portion with the pleat-like zone located along at least a portion of a length of the leading edge portion and the pleat-like zone being distinct from an adjoining main portion of each wiper; and positioning each wiper relative to adjacent wipers to form the stack of wipers.

In other aspects, the invention provides a system for forming a stack of wipers. The system includes a supply station which provides a supply of a common material. A pleat station receives the common material from the supply station and then forms a plurality of panels, each panel adjacent to at least one other panel, and which creates a pleat-like zone located along at least one side of each panel. A converting station then converts the plurality of panels into a plurality of wipers, each wiper of the plurality of wipers including a leading edge portion with the pleat-like zone located along at least a portion of a length of the leading edge portion and the pleat-like zone being distinct from an adjoining main portion of each wiper and wherein each wiper is positioned relative to adjacent wipers to form the stack of wipers.

In yet other aspects, the invention provides various configurations for the process and system for making wipers, for wipers per se, and for the wipers relative to other wipers such as in a stack of wipers.

In still other aspects, the invention provides wipers for use in various types of dispensers, e.g., rigid to non-rigid, and for dispensing in various manners such as reach-in dispensing with wet or dry wipers.

Various definitions used throughout the specification are provided first, followed by a further description of aspects of the invention.

#### Definitions

As used herein, when the following wiper has at least a portion through the opening of the dispenser or package and is intentionally maintained in the opening after the leading wiper is completely separated from the following wiper, this is referred to as “pop-up” format or dispensing. To be intentionally maintained in the opening means the opening is configured to maintain the wiper in the opening between successive dispensing occasions, such as through use of a constricting orifice or opening being smaller than the wiper in at least one dimension of the wiper.

As used herein, “reach-in” dispensing is understood to mean having to fetch a wiper out of a dispenser through an opening substantially co-extensive with the walls of the dispenser or through a restricted opening smaller than the perimeter defined by the walls. In either case, the top wiper for dispensing rests on top of the remainder of the stack of wipers and the top wiper needs to be separated from the remainder of the stack each time anew when dispensing is desired. An example of a reach-in dispenser is found in the currently available baby wipers product sold by Kimberly-Clark Corporation of Neenah, Wis. under the trade name HUGGIES® Supreme Care.

As used herein, the term “discrete” means wipers are separate from one another upon formation into a plurality of wipers, such as a stack of wipers, and which wipers are intended to not interact with one another upon dispensing (other than that which may occur intermittently due to adhesion which may exist between wipers because their adjacent surfaces are positioned against one another, and particularly when the wipers are wet wipers). For example, each wiper in the plurality is not designed to intentionally and near consistently throughout the plurality of wipers draw up any portion of the succeeding wiper.

As used herein, the term “wet wiper” refers to a fibrous sheet that has a liquid applied thereto during manufacture. The amount of liquid or solution contained within each wet wiper may vary depending upon the type of material being used to provide the wet wiper, the type of liquid being used, the type of container being used to store the stack of wet wipers, and the desired end use of the wet wiper. Generally, each wet wiper may contain from about 25 to about 700 weight percent or from about 200 to about 400 weight percent liquid based on the dry weight of the wiper, for improved wiping in certain situations. To determine the liquid add-on, first the weight of a just-manufactured dry wiper is determined. Then, the amount of liquid by weight equal to the weight of the just-manufactured dry wiper, or an increased amount of liquid measured as a percent add-on based on the weight of the just-manufactured dry wiper, is added to the wiper to make it moistened, and then known as a “wet wiper” or “wet wipers”. The liquid may include a fragrance and/or an emollient and may serve to aid the fibrous sheet in retention of materials, which are to be wiped up during its utilization.

As used herein, the term “nonwoven web” means a structure or a web of material that has been formed without use of traditional fabric forming processes such as weaving or knitting, to produce a structure of individual fibers or threads that are intermeshed, but not in an identifiable, repeating manner. Non-woven webs have been, in the past, formed by a variety of conventional processes such as, for example, meltblowing processes, spunbonding processes, film aperturing processes and staple fiber carding processes.

As used herein, the term “coform” means a non-woven composite material of air-formed matrix material comprising thermoplastic polymeric meltblown fibers such as, for example, microfibers having an average fiber diameter of less than about 10 microns, and a multiplicity of individualized absorbent fibers such as, for example, wood pulp fibers disposed throughout the matrix of polymer microfibers and engaging at least some of the microfibers to space the microfibers apart from each other. The absorbent fibers are interconnected by and held captive within the matrix of microfibers by mechanical entanglement of the microfibers with the absorbent fibers, the mechanical entanglement and interconnection of the microfibers and absorbent fibers alone form a coherent integrated fibrous structure. The coherent integrated fibrous structure may be formed by the microfibers and wood pulp fibers without any adhesive, molecular or hydrogen bonds between the two different types of fibers. The absorbent fibers are preferably distributed uniformly throughout the matrix of microfibers to provide a homogeneous material. These materials are prepared according to the descriptions in U.S. Pat. No. 4,100,324 to Anderson et al. (“Anderson”), U.S. Pat. No. 5,508,102 to Georger et al. (“Georger”) and U.S. Pat. No. 5,385,775 to Wright (“Wright”), as well as related teaching in U.S. patent application Ser. No. 09/751,329, entitled “Composite Material With Cloth-Like Feel”, filed Dec. 29, 2000 (also known as WO 02/053365 published Jul. 11, 2002) and U.S. patent application Ser. No. 10/032,703, entitled “Method And Apparatus For Controlling Retraction Of Composite Materials”, filed Dec. 28, 2001 (also known as WO 02/053368 published Jul. 11, 2002), all assigned to the same Assignee as in the present invention.

The term “elastic” as used herein, means any material which, upon application of a biasing force, is stretchable, that is, elongatable at least about 5 percent (i.e., to a stretched, biased length which is at least about 105 percent of its relaxed unbiased length), and which, may recover at least 5 percent of its elongation upon release of the stretching, elongating force. A hypothetical example would be a one (1) cm sample of a

material which is elongatable to at least 1.05 cm and which, upon being elongated to 1.05 cm and released, may recover to a length of not more than 1.0475 cm. Many elastic materials may be elongated by much more than 5 percent (i.e., much more than 105 percent of their relaxed length), for example, elongated 100 percent or more, and many of these may recover to substantially their initial relaxed length, for example, to within 105 percent of their original relaxed length, upon release of the stretching force.

As used herein, the term “non-elastic” refers to any material which does not fall within the definition of “elastic,” above.

The terms “recover” and “recovery” as used herein refer to a contraction of a stretched material upon termination of a biasing force following stretching of the material by application of the biasing force. For example, if a material having a relaxed, unbiased length of one (1) cm is elongated 50 percent by stretching to a length of one and one half (1.5) cm the material would be elongated 50 percent (0.5 cm) and would have a stretched length that is 150 percent of its relaxed length. If this exemplary stretched material contracted, that is recovered to a length of one and one tenth (1.1) cm after release of the biasing and stretching force, the material would have recovered 80 percent (0.4 cm) of its one-half (0.5) cm elongation. Recovery may be expressed as [(maximum stretch length—final sample length)/(maximum stretch length—initial sample length)] times 100.

As used herein, the term “machine direction (MD)” refers to the direction of travel of the forming surface onto which fibers are deposited during formation of a non-woven fibrous web.

As used herein, the term “cross-machine direction (CD)” refers to the direction which is essentially perpendicular to the machine direction and in the plane of the machine direction defined above.

As used herein, the term “composite elastic material (CEM)” refers to a non-woven fabric including at least one layer of non-woven, elastic material and at least one layer of non-woven, non-elastic material, e.g., a gatherable layer. The CEMs of the invention include materials with combinations of layers that include at least one elastic web layer and at least one non-elastic web layer, e.g., an elastic layer between two gatherable layers. The elastic non-woven web layer(s) are joined or bonded in at least two locations to the non-elastic non-woven web layer(s). Preferably, the bonding is at intermittent bonding points or areas while the non-woven web layer(s) are in juxtaposed configuration and while the elastic non-woven web layer(s) have a tensioning force applied thereto in order to bring the elastic non-woven web to a stretched condition. Upon removal of the tensioning force after joining of the web layers, an elastic non-woven web layer will attempt to recover to its unstretched condition and will thereby gather the non-elastic non-woven web layer between the points or areas of joining of the two layers. The composite material is elastic in the direction of stretching of the elastic layer during joining of the layers and may be stretched until the gathers of the non-elastic non-woven web or film layer have been removed. A stretch-bonded laminate may include more than two layers. For example, the elastic non-woven web or film may have a non-elastic non-woven web layer joined to both of its sides while it is in a stretched condition so that a three layer non-woven web composite is formed having the structure of gathered non-elastic (non-woven web or film) /elastic (non-woven web or film)/gathered non-elastic (non-woven web or film). Yet other combinations of elastic and non-elastic layers may also be utilized. Such CEMs are disclosed, for example, in U.S. Pat. No.

4,720,415 to Vander Wielen et al., U.S. Pat. No. 5,385,775 to Wright, and particularly, for example, in WO 02/053365 and WO 02/053368, mentioned previously.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and are intended to provide further explanation of the invention claimed. The accompanying drawings, which are incorporated in and constitute part of this specification, are included to illustrate and provide a further understanding of the wipes of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The drawings are merely representative and are not intended to limit the scope of the claims. Like parts depicted in the drawings are referred to by the same reference numerals.

FIG. 1 representatively shows a schematic view of an apparatus and process for forming a stack of wipes from a common material, in accordance with the present invention.

FIG. 2 representatively shows a top view of a portion of the common material traveling in the MD through the apparatus of FIG. 1, taken along the line 2-2.

FIG. 3 representatively shows a top view of a portion of a common material traveling in the MD through the apparatus of FIG. 1, taken along the line 3-3.

FIG. 4 representatively shows a top view of a portion of a common material traveling in the MD through the apparatus of FIG. 1, taken along the line 3-3.

FIG. 5 representatively shows a top view of a portion of a common material traveling in the MD through the apparatus of FIG. 1, taken along the line 3-3.

FIGS. 2A, 3A, 4A and 5A representatively show an enlarged cross sectional view of the common material, taken along lines 2-2, 3-3, 4-4, and 5-5, respectively.

FIG. 6 representatively shows a top view of a wipe of the present invention, which may be in a z-fold configuration.

FIG. 6A representatively shows an enlarged side view of the wipe of FIG. 6, taken along the line 6A-6A.

FIG. 6B representatively shows an enlarged cross sectional end view of the wipe of FIG. 6, taken along the line 6B-6B.

FIG. 7 representatively shows a perspective view of a type of dispenser for use with wipes of the present invention, where wipes are located therein and the dispenser is open.

#### DETAILED DESCRIPTION OF THE INVENTION

As representatively illustrated throughout the figures, and for explanation now referring to FIG. 1, and supporting FIGS. 2 to 5A inclusive, there is depicted a system 10 and process for forming a stack 12 of wipes 62 (FIGS. 6 to 6B inclusive). Generally, system 10 includes a supply station 20, a pleat station 30 and a converting station 60, all through which a material 22 is formed into the stack 12 of wipes 62 for use in a wipes dispenser 1300 (FIG. 7). Material 22 is referred to as common material because the wipes 62 adjacent one another in the stack 12 are formed from what at one time is a unified piece of material, that is, material 22 which is common to each adjacent wipe (up to the total number of panels adjacent each other) during the formation process. Additional aspects of the system are now further explained.

The supply station 20 provides a supply of material 22. Material 22 maybe any elastic material for use as a wipe, e.g., CEM. The supply may be provided on-line or off-line. On-line means material 22 is provided to system 10 as the material itself is being formed contemporaneously with its successive use in system 10. Off-line means material 22 is separately

formed well in advance of its use in system 10 so that material 22 is provided to system 10 in bulk form, such as on a roll 23 or other conventional bulk manner. From supply station 20, material 22 travels into pleat station 30.

The pleat station receives material 22. Material 22 may pass through a first speed control Assembly 38 which maintains the material 22 at a first speed. For example, assembly 38 (as well as later assemblies 40, 44 and 48) may be conventional speed controllable nip rollers, S-wrap rollers, or similar functioning structure(s). From here, the material travels into an embossing assembly 40 which embosses the common material to define a plurality of panels 32, and such that each panel 32 is adjacent to at least one other panel 32. Embossing may include one or a combination of pressure and/or heat (e.g., without limitation, thermal embossing, ultra sonics, infrared, hot air knife, microwave) imparted to material 22. If the material includes polymer, such heat and/or pressure may cause melting of a portion of the composite elastic material. Simultaneous with embossing assembly 40, i.e., part of assembly 40 as seen in FIG. 1, or separately (not shown) but prior to assembly 40, station 30 may include a second speed control assembly which maintains material 22 at a second speed, where the second speed is greater than the first speed. For example, embossing assembly 40 may be any conventional embossing and/or speed control unit used by one of ordinary skill in conjunction with the teachings herein, or similar functioning structure(s). Such could be a conventional embossing roll formed with protruding rings that correspond to embossed tracks like those formed at sides 36 in FIG. 3. It should be understood that other techniques and structures known to those of skill in the art for embossing the material could also be used to practice the invention, in combination with the teachings herein. The particular embossing unit is not important. What Is Important Is that the unit imparts sufficient heat and/or pressure to material 22 to affect the elastic and/or non-elastic properties of the material to form embossed tracks along sides 36 that have a different retraction characteristic (i.e., more or less) than the retraction characteristic of the adjoining main portion of the material when tension on the material is lessened.

After traveling through assembly 40, the embossed material 22 goes through a first separating assembly 44 which separates the material 22 to form the plurality of panels 32 separated from each other. An example of an apparatus that could be readily employed to operate as separating assembly 44 is any conventional slitter used by one of ordinary skill in conjunction with the teachings herein, or similar functioning structure(s). It should be understood that other techniques and structures known to those of skill in the art for making a slit or cut in the material could also be used to practice the invention, in combination with the teachings herein.

While the accompanying drawings show the embossing and separating steps taking place in-line sequentially, it should be understood that such is not required. For example, one could form material 22 up to the separating assembly 44 and then wind up the embossed only material for later use. At a later time and/or on a separate machine, one could take the already embossed material 22 and then feed it into a separating assembly (advantageously under tension similar that that when embossed) and then continue to convert the panels into a stack of wipes (as discussed herein).

Simultaneous with separating assembly 44, i.e., part of assembly 44 as seen in FIG. 1, or separately (not shown) from assembly 44, station 30 may include a third speed control assembly which maintains the material (now in the form of separated panels 32) at a third speed, where the third speed is about the same as the second speed. Next, the material 22 may

travel to a fourth speed control assembly 48 which maintains the material (now in the form of separated panels 32) at a fourth speed, where the fourth speed is less than the third speed. At this point, station 30 has created a pleat-like zone 34 located along at least one side 36 of each panel 32. Alternatively, and advantageously, the separating assembly may be configured to separate the embossed zones (e.g., at sides 36 as seen in FIGS. 3 and 3A) somewhere within the embossed zones (e.g., as in FIGS. 4 and 4A) so as to create the pleat-like zone 34 located along both sides 36 of each panel 32 (e.g., as seen in FIGS. 5 and 5A).

Without being limited to a theory of understanding, it is believed that the pleat-like zone 34 located along at least one side 36 of each panel is caused by differential retraction of material 22, namely, the pleat-like zone is caused to retract at a different rate than the adjoining main portion of each panel. For example, this may be accomplished in one way by varying the speed of material 22 when traveling between the first and fourth speed control assemblies 38 and 48, respectively. That is, by operating assembly 38 at a first speed, and operating the second speed control assembly (i.e., assembly 40 in FIG. 1) at a second speed that is greater than the first speed, then the material is caused to stretch between assemblies 38 and 40. In the stretched condition, the material may be subjected to a treatment in the MD along a portion of the material (e.g., heat, pressure, embossing, thermal embossing, other treatments mentioned previously, a combination of these) to define MD panels. Once the panels are formed, and advantageously (though not required) while also in this stretch condition, the material may be separated between panels by the separating assembly 44 (e.g., by cutting, slitting, or similar means to accomplish the desired separating), where the third speed control assembly (i.e., assembly 44 in FIG. 1) may be operated at about the same speed as assembly 40. Alternatively, the separating could occur later, but such may not be advantageous from a processing perspective. Regardless when the separating is performed, after the panels are formed in the MD, and because of the treatment applied to the material by assembly 40, when the material is allowed to relax or retract, it will tend to do so differently at the treatment zone from the adjoining main portion of the panel that was not so treated. The material may be allowed to relax or retract when the fourth speed control assembly 48 operates at a fourth speed which is less than the speed of the third speed control assembly (i.e., assembly 44 in FIG. 1). By varying the speed of assemblies 44 and 48 in this way, the untreated material that wants to retract to its original unstretched condition is allowed to do so. However, when doing so, it is observed that the treated zone does not retract much, if at all. It is the differential retraction that is believed to form the pleat-like zone along the side of the panels, and such is particularly prominent when the treatment zone is separated somewhere between its outer bounds so the loose side(s) of each panel is only confined by one adjoining main portion of the panel. Also, the quality of the pleat-like structures formed in the pleat-like zone may be varied by varying the combination of heat and/or pressure used to perform the embossing, as well as varying the elastic properties of the material and/or the amount of stretch applied to the material between assemblies 38 and 48, respectively. In sum, it is contemplated that all materials which can be caused to have such differential retraction when subjected to stretched and unstretched conditions may be used to embody the subject invention, and for example, where CEMs may be advantageous but are not required. Similarly, it is further contemplated that all treatments which can be used to impart such differential retraction upon a material which is subjected to stretched and

unstretched conditions may be used to embody the subject invention, and for example, where thermal embossing may be advantageous but is not required.

Next, converting station 60 receives the material 22 (now in the form of separated panels 32 with pleat-like sides) from assembly 48 and then converts the plurality of separate panels 32 into a plurality of wipes 62. For example, such converting may be performed by a folding assembly 70 which folds the plurality of panels 32 into a plurality of folded panels. Each of the plurality of folded panels may be positioned relative to each adjacent folded panel to form a ribbon 76 of folded panels 32. An example of an apparatus that may be employed to operate as station 60 may be a conventional web or material folding unit used by one of ordinary skill in conjunction with the teachings herein, or similar functioning structure(s). It should be understood that other techniques and structures known to those of skill in the art for converting the material into wipes could also be used to practice the invention, in combination with the teachings herein.

From folding assembly 70, ribbon 76 travels to a second separating assembly 78 of converting station 60. Assembly 78 separates the ribbon to form a plurality of wipes 62 into the stack 12 of wipes. As formed (e.g., FIGS. 6 to 6B in one possible configuration), each wipe 62 of the plurality of wipes includes the leading edge portion 64 with the pleat-like zone 34 located along at least a portion of a length 66 of the leading edge portion 64. The leading edge portion is generally defined as that part of the wipe from the tip of the lead edge back towards the adjoining main portion up to the first fold of the wipe if folded or the leading 30% of the length of the wipe if not folded. The pleat-like zone need not extend from the tip of the leading edge back towards the adjoining main portion but could be set back from the tip of the leading edge and then extend back towards the adjoining main portion (i.e., so as to form the pleat-like zone between two non pleat-like zones such as the main portion and with the pleat-like zone still located in the leading edge portion). The pleat-like zone is distinct from an adjoining main portion 68 of each wipe and each wipe is positioned relative to adjacent wipes 62 to form the stack of wipes 12. The pleat-like zone may be from about 1 mm deep to about 3 cm deep (i.e., measuring from the tip of the leading edge back towards the adjoining main portion) or deeper if desired, and advantageously about 1 cm+/-1 cm. As seen in FIG. 6A, pleats are formed where material in zone 34 doubles over on itself. In addition to the different retraction characteristics between zone 34 and the adjoining main portion 68, the thickness (also called caliper) of these portions of the material may differ. For example, the material in zone 34 may be thinner than the material in main portion 68 (e.g., due to the embossing and/or differential retraction characteristics). An example of an apparatus that may be employed to operate as assembly 78 may include a conventional cooperating rotary cutter and anvil roller. Stacks 12 may be alternately referred to as clips of wipes when the stacks 12 are made into a larger stack of like clips or stacks 12. In such a case, the stacks/clips may then pass to a stacker assembly (not shown). In the stacker assembly, the stacks/clips may be stacked one upon another into a larger stack. A desired number of stacks/clips are stacked one on top of another in this manner. Then, the completed stack of stacks/clips may be moved to a packaging assembly (not shown) where the stacks/clips may be put in various types of dispensers (e.g., tubs, bags, etc.) and then made ready for commercial sale and use. Any conventional the stacker assembly could be used by one of ordinary skill in conjunction with the teachings herein, or similar functioning structure(s). It should be understood that other techniques and structures known to those of skill in

the art for making clips and/or stacks of wipes could also be used to practice the invention, in combination with the teachings herein.

Additionally, as the separated panels 32 travel through the assembly 70, they may encounter a moistening assembly 74. Assembly 74 may be an elongate horizontal bar having ports for imparting liquid or solution onto the moving panels as they are folded and formed into ribbon 76. A liquid or solution may be provided at a desired add-on rate and in a conventional manner to the elongate horizontal bar so solution may be applied through the ports to the moving panels 32. Such application may include spraying or drooling with an elongate horizontal bar, or may include alternate structures (not shown) for techniques such as printing, a bath, a flooded nip, or hollowed out folding boards with spray orifices, all which would project fluid in a rather even horizontal plane as the panels 32 move through assembly 70. However, if a dry final product is desired the moistening assembly 74 may be eliminated or just not used, and otherwise the system and process may be the same.

In another aspect, the invention includes a process for forming the stack 12 of wipes 62 (e.g., using system 10). Generally, the process includes providing the supply of the common material 22. Then, the process includes forming the plurality of panels 32, each panel adjacent to at least one other panel. Next, and/or simultaneously, the process includes creating the pleat-like zone 34 located along at least one side 36 of each panel 32. The steps of forming and creating may be accomplished, for example, by: (i) stretching the material 22 and thermally embossing a portion of the stretched material along at least one edge of each panel 32; (ii) slitting the material along the thermal embossing portion of the material to form the plurality of separate panels 32; and (iii) relaxing the plurality of separate panels 32 to create the pleat-like zone. Finally, the process includes converting the plurality of panels 32 into the plurality of wipes 62, and positioning each wipe relative to adjacent wipes to form the stack of wipes. As such, each wipe 62 of the plurality of wipes includes the leading edge portion 64 with the pleat-like zone 34 located along at least a portion of the length of the leading edge portion 64 and the pleat-like zone being distinct from the adjoining main portion 68 of each wipe.

Additionally, the process and wipes, may include one or more of the following features. Each wipe may be folded upon itself at least once, e.g., achieved through folding assembly 70, and even folded upon itself twice or more as desired. If a moistening solution is used, the plurality of wipes 62 may be a plurality of wet wipes. The pleat-like zone 34 may extend along substantially an entire length of the leading edge portion 64. As taught, the stack of wipes 62 is configured in a reach-in format to dispense the wipes from the wipes dispenser 1300. Each wipe 62 in the plurality of wipes may be discrete from each adjacent wipe. Each wipe 62 of the plurality of wipes may include a trailing edge with the pleat-like zone 34 located along at least a portion of the length of the trailing edge 65, in addition to or rather than, the pleat-like zone along the leading edge portion 64. Each wipe may be non-interfolded with each adjacent wipe. Each wipe 62 may be folded such that the leading edge portion 64 is located between opposite sides 67 of the wipe when the wipe is folded upon itself.

While any of a variety of materials, equipment and process ranges could be used, based on the teachings herein, some sample wipes have been made according to the following conditions (which are merely illustrative of the invention and do not limit its scope). A CEM was provided as the material, and such according to the teachings in WO 02/053365 and

WO 02/053368, each mentioned previously, and particularly the material that is found in currently commercially available baby wipes from Kimberly-Clark Corporation of Neenah, Wis. under the tradename HUGGIES® Supreme Care (moistened with 330% add-on of HUGGIES® Supreme Care solution). The sample CEM included coform facings weighing about 22 to about 30 grams per square meter (gsm), e.g., 26.5 gsm. The coform had a pulp to polymer ratio of about 60% to about 75% pulp and about 25% to about 40% meltblown polymer, e.g., 65% pulp and 35% meltblown polymer. The elastomer weight of the filaments and meltblown elastomer on the webformer (prior to stretching) was about 20 to about 40 gsm, e.g., 30 gsm. The elastomer filament to meltblown ratio was about 50% to about 90% filaments and about 10% to about 50% meltblown, e.g., 70% filaments and 30% meltblown. The three layer sample CEM (coform—filament and meltblown elastomer—coform) had a weight of about 70 to about 90 gsm, e.g., 85 gsm. The sample CEM had a retraction value of about 10% to about 40%, e.g., 20%. Such can be accomplished, for example, by bonding the three layers together at 1000 feet per minute (fpm) but then winding them up at 800 fpm (i.e., 20% less than the bonding speed). The embossing pattern for bonding the three layers together was a 4.5 mm bear sine wave, the same as taught in Ser. No. 10/032, 703 and used in the commercially available HUGGIES® Supreme Care baby wipes. The sample CEM was formed off-line as a 62 inch wide roll, and provided into a system schematically set up like that seen in FIG. 1.

To turn the sample CEM into a stack of wipes of the invention, steps similar to that discussed for system 10 were conducted. For example, eight panels were formed and each of these in turn formed into discrete, zigzag configured, non-interfolded wipes (like that seen in FIGS. 6 to 6B) in a stack of wipes (e.g., 8 wipes to a stack/clip and multiple stacks/clips to form a larger stack of wipes such as 8×8 for 64 total wipes), each wipe measuring 7.5 inches by 7.5 inches. To achieve the desired differential retraction, assemblies like those seen in FIG. 1 were run at the following speeds: assembly 38 at 100 fpm, assembly 40 at 112 fpm, assembly 44 at 112 fpm and assembly 48 at 100 fpm. While these particular speeds were used, other speeds have also been used to accomplish draws (i.e., speed differentials applied to the material when traveling between assemblies 38 and 48, respectively) from about 5% to about 20%, and advantageously about 10% to about 15%, for example. The treated zone formed by assembly 40 was separated (e.g., by slitting) near its middle so as to form pleat-like zones along both sides of each panel. It is believed advantageous, though not necessary, that the separating track to a tolerance of  $\pm 1/8$  inch and maybe even  $\pm 1/16$  inch. In this regard, variability may be reduced by locating the separating assembly as close as possible to the embossing assembly. The separated panels were then moistened with the commercially available HUGGIES® Supreme Care baby wipes solution, folded into the zigzag configuration by a conventional folding assembly and the ribbon cut to desired length forming the stacks/clips which were then put into dispensers such as the commercially available HUGGIES® Supreme Care baby wipes tubs.

The plurality of wipes 62 of the present invention, e.g., wet wipes, may be arranged in a package or dispenser in any manner which provides convenient and reliable one at a time dispensing, as taught herein. For example, the wipes may be arranged in a dispenser or package as a plurality of individual sheets arranged in a stacked configuration to provide a stack of wipes which may or may not be individually folded. The wipes may be individual wipes which are folded in a c-fold, z-fold, quarter fold or other zigzag fold or non-interfolded

configurations as are known to those skilled in the art. The stack 12 may include a plurality of wipes 62 stacked one on top of each other in a non-interfolded configuration. For such a “non-interfolded” wipe, each wipe is folded onto itself with no portion of another wipe being positioned between or underneath any portion the folds of the adjacent wipe(s). These configurations for wipes, as well as those discussed above, may be provided by means known to those skilled in the art.

Referring generally to the Figures now, the plurality of wipes 62, such as a stack 12 of wipes, may include any suitable number of individual wipes depending upon the desired packaging and end use. For example, the plurality may be configured to include a stack of wipes which may include at least about 5 wet wipes, from about 16 to about 320 individual wipes, or from about 32 to about 160 wipes. The size and shape of the final stack of wipes is dependent upon the size and shape of the package/dispenser and vice versa. For example, the length of an assembled stack of wipes may be about 190 mm, with a height of about 90 mm and a width of about 100 mm.

Each wipe may be generally rectangular in shape and define a pair of opposite sides and a pair of opposite end edges which may be referred to as a leading edge and a trailing edge. The leading edge of each wipe is typically positioned in the package/dispenser to be grasped by a user to facilitate a removal of the wet wipe from the package/dispenser. Each wipe defines an unfolded width and an unfolded length. The wipe may have any suitable unfolded width and length. For example, the wipe may have an unfolded length of from about 2.0 to about 80.0 centimeters and desirably from about 10.0 to about 26.0 centimeters and an unfolded width of from about 2.0 to about 80.0 centimeters and desirably from about 10.0 to about 45.0 centimeters. In reference to FIG. 6, the width of a wipe is defined along dimension 66 and the length of a wipe along the perpendicular dimension in the same plane.

Materials suitable for wipes of the present invention are well known to those skilled in the art. The wipes may be made from any material suitable for use as a wipe, and which has an elastic characteristic in at least the MD, including nonwoven webs (e.g., meltblown, coform, airlaid, bonded-carded web materials) spunlace materials, hydroentangled materials, tissue materials, paper materials, high wet-strength tissue and the like and may comprise synthetic or natural fibers or combinations thereof. The wipes may have a dry basis weight of from about 25 to about 120 grams per square meter and desirably from about 40 to about 90 grams per square meter. In a particular aspect, the wipes may comprise a CEM, having a basis weight of from about 60 to about 100 grams per square meter and desirably about 80-85 grams per square meter. An example of such a CEM for use in the present invention are discussed above in the Definitions section and may be found as the baby wipes product presently sold by Kimberly-Clark Corporation and known as HUGGIES® Supreme Care baby wipes.

In another aspect of the invention, wipes 12 may contain a liquid which may be any liquid or solution which may be absorbed into the wipes (e.g., water based, oil based, others), thus making them wet wipes. The wipes may be moistened at any time before the wipes are actually used by the consumer. Preferably they are moistened some time during the manufacturing process before or contemporaneous with the plurality of wipes being sealed in a dispenser or other packaging for next use by a product user. The liquid contained within the wet wipes may include any suitable components which provide the desired wiping properties. For example, the components may include water, emollients, surfactants, preserva-

tives, chelating agents, pH buffers, fragrances or combinations thereof. The liquid may also contain lotions, ointments and/or medicaments. An example of such a liquid for use in the present invention is found in the baby wipes product presently sold by Kimberly-Clark Corporation and known as HUGGIES® Natural Care baby wipes or Supreme Care baby wipes. The amount of liquid or solution contained within each wet wipe may vary depending upon the type of material being used to provide the wet wipe, the type of liquid or solution being used, the type of container being used to store the stack of wet wipes, and the desired end use of the wet wipe. In a particular aspect wherein the wet wipe is made from CEM, the amount of liquid contained within the wet wipe is from about 250 to about 400 weight percent and desirably about 330 weight percent based on the dry weight of the wet wipe. If the amount of liquid is less than the above-identified range, the wet wipes may be too dry and may not adequately perform depending on the desired task. If the amount of liquid is greater than the above-identified range, the wet wipes may be over saturated and soggy and the liquid may pool in the bottom of the container.

An example of rigid containers suitable for use with the present invention are found in the product presently sold by Kimberly-Clark Corporation and known as HUGGIES® Natural Care baby wipes or HUGGIES® Supreme Care baby wipes. FIG. 7 shows such a rigid plastic wet wipes dispenser **1300**. Each dispenser **1300** includes a lid **1301** hingedly attached to a base **1302**. The dispensing opening is coextensive with the inside perimeter of the container, and is through which individual wet wipes are removed from the inside cavity in a reach-in format. The lid is secured in a closed position by a suitable latching mechanism, in which a protrusion **1309** in the front lip of the base is engaged by an opening **1311** in the front lip of the lid. In use, the lid is opened and then access to the inside cavity is gained. The user then passes his or her hand, etc. through the container opening to grab the first wipe in the stack of wipes. Once the user grabs the wipe, it may then pass through the opening as the user pulls it up. The user may pass the complete wipe through the dispensing opening and out of the container or package. After the desired number of wipes are taken, the lid may be sealed closed. An example of non-rigid containers for use with the present invention may be found in the baby wipes refill packages presently sold by Kimberly-Clark Corporation and known as HUGGIES® Natural Care or HUGGIES® Supreme Care baby wipes resealable refill packs.

All publications, patents, and patent documents cited in the specification are incorporated by reference herein, as though individually incorporated by reference. In the case of any inconsistencies, the present disclosure, including any definitions herein, will prevail. While the invention has been described in detail with respect to the specific aspects thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing, may readily conceive

of alterations to, variations of, and equivalents to these aspects which fall within the spirit and scope of the present invention, which should be assessed accordingly to that of the appended claims.

What is claimed is:

1. A system for forming a stack of wipes comprising:
  - a supply station which provides a supply of a common material;
  - a pleat station which receives the common material and then forms a plurality of panels, each panel adjacent to at least one other panel, and which creates a pleated zone having at least one pleat located along at least one side of each panel;
  - a converting station which converts the plurality of panels into a plurality of wipes, each wipe of the plurality of wipes including a leading edge portion with the pleated zone located along at least a portion of a length of the leading edge portion and the pleated zone being distinct from an adjoining main portion of each wipe and wherein each wipe is positioned relative to adjacent wipes to form the stack of wipes; and
 wherein the pleat station further comprises:
  - a first speed control assembly which maintains the common material at a first speed;
  - an embossing assembly which embosses the common material to define the plurality of panels; and
  - a second speed control assembly which maintains the common material at a second speed, where the second speed is greater than the first speed.
2. The system of claim 1 wherein the embossing assembly includes the second speed control assembly.
3. The system of claim 1 wherein the pleat station further comprises a first separating assembly which separates the common material to then form the plurality of panels.
4. The system of claim 3 wherein the pleat station further comprise a third speed control assembly which maintains the common material at a third speed, where the third speed is about the same as the second speed, and a fourth speed control assembly which maintains the common material at a fourth speed, where the fourth speed is less than the third speed.
5. The system of claim 4 wherein the first separating assembly includes the third speed control assembly.
6. The system of claim 4 wherein the converting station further comprises a folding assembly which folds the plurality of panels into a plurality of folded panels and each of the plurality of folded panels is position relative to each adjacent folded panel to form a ribbon of folded panels.
7. The system of claim 6 wherein the converting station further comprises a second separating assembly which separates the ribbon to form the plurality of wipes of the stack of wipes, each wipe of the plurality of wipes including the leading edge portion with the pleated zone.

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